

I/WE CLAIM:

1. A method for non-contact determination of a liquid content of a sample of a substance, comprising:
 - a. exposing the sample to an environment in which said liquid evaporates from a surface of the sample, resulting in a temperature change on the surface;
 - b. obtaining an emissivity image of the sample; and
 - c. processing the image to determine the liquid content of the substance.
2. A method as claimed in claim 1, wherein said processing determines a spatial distribution of the liquid content over at least a portion of the surface of the sample.
3. A method as claimed in claim 2, wherein said spatial distribution is used to determine a structural inhomogeneity of the sample.
4. A method as claimed in claim 3, wherein said processing of the image is conducted using gray level calibration curves to determine the liquid content.
5. A method as claimed in claim 4 comprising generating one of the gray level calibration curves from a plurality of measured gray level values of an emissivity image of a reference sample of the substance with a known liquid content of the liquid within a selected range of ambient temperatures and relative humidity.

6. A method as claimed in claim 5 comprising recording the emissivity image of both the sample to be measured and the reference sample of the substance, using an imaging radiometer.
7. A method as claimed in claim 1 wherein the emissivity image of the sample of the substance is obtained from one side of the sample of the substance.
8. A method as claimed in claim 1 wherein the emissivity image of the sample of the substance is obtained from opposed sides of the sample of the substance.
9. A method as claimed in claim 8 wherein the emissivity image of the sample of the substance is recorded from opposed sides of the sample of the substance using a single imaging radiometer.
10. A method as claimed in claim 8 wherein the emissivity image of the sample of the substance is recorded from opposed sides of the sample of the substance using a pair of imaging radiometers positioned at the opposed sides of the sample of the substance.
11. A method as claimed in claim 1 wherein the sample is in a stationary condition.
12. A method as claimed in claim 1 wherein the sample is in a moving condition.
13. A method as claimed in claim 1 wherein the substance is a solid substance.

14. A method as claimed in claim 1 wherein the substance is a liquid substance.
15. A method for non-contact determination of structural inhomogeneity of a sample of a substance, comprising:
 - a. exposing the sample to an environment in which a liquid evaporates from a surface of the sample, resulting in a temperature change on the surface;
 - b. obtaining an emissivity image of the sample of the substance;
 - c. converting the obtained emissivity image into digital data;
 - d. processing the data using gray level calibration curves to measure variation in a two-dimensional liquid distribution of the substance; and
 - e. determining the structural inhomogeneity of the sample of the substance in accordance with the measured variation in the two-dimensional liquid distribution of the substance.
16. A method as claimed in claim 15 comprising generating one of the gray level calibration curves from a plurality of measured gray level values of an emissivity image of a reference sample of the substance with a known liquid content of the liquid within a selected range of ambient temperatures and relative humidity.
17. A method as claimed in claim 16 comprising recording the emissivity image of both the sample to be measured and the reference sample of the substance, using an imaging radiometer.

18. A method as claimed in claim 15 wherein the emissivity image of the sample of the substance is obtained from one side of the sample of the substance.
19. A method as claimed in claim 15 wherein the emissivity image of the sample of the substance is obtained from opposed sides of the sample of the substance.
20. A method as claimed in claim 19 wherein the emissivity image of the sample of the substance is recorded from opposed sides of the sample of the substance using a single imaging radiometer.
21. A method as claimed in claim 19 wherein the emissivity image of the sample of the substance is recorded from opposed sides of the sample of the substance using a pair of imaging radiometers positioned at the opposed sides of the sample of the substance.
22. A method for sorting wood and kiln drying same comprising:
 - a. obtaining a set of data representing a two-dimensional moisture distribution in a plurality of pieces of wood;
 - b. sorting the pieces of wood into batches having similar drying program needs according to said two-dimensional moisture distribution therein; and

- c. drying the batches in a kiln drier according to said drying program determined for each individual batch.
23. A method as claimed in claim 22, wherein said drying program comprises a temperature and duration of drying depending on an evaluation of the liquid content within said two-dimensional moisture distribution.
24. A method as claimed in claim 22, wherein step (a) comprises:
- obtaining an emissivity image of the piece of wood;
- converting the obtained emissivity image into digital data; and
- processing the digital data using gray level calibration curves to generate the set of data representative of said two-dimensional moisture distribution in the piece of wood.
25. A method as claimed in claim 22 comprising generating one of the gray level calibration curves from a plurality of measured gray level values of an emissivity image of a reference piece of wood with a known moisture content within a selected range of ambient temperatures and relative humidity.
26. A method as claimed in claim 25 comprising recording the emissivity image of both the piece of wood to be sorted and the reference piece of wood, using an imaging radiometer.

27. An apparatus for non-contact measurements of a liquid content of a substance, comprising:
 - a. a radiometer for recording an emissivity image of the substance;
 - b. means for storing the emissivity image of the substance;
 - c. means for recording an ambient temperature;
 - d. means for recording a relative humidity;
 - e. means for converting the emissivity image into digital data; and
 - f. a computing device for data processing and determining the liquid content of the substance.
28. An apparatus as claimed in claim 27 further comprising means for generating gray level calibration curves for use in the data processing and the determining of the liquid content of the substance.
29. An apparatus as claimed in claim 28 further comprising a database of a plurality of sets of measured gray level values corresponding to a plurality of emissivity images of reference samples of substances with known liquid contents within a selected range of ambient temperatures and relative humidity.
30. An apparatus as claimed in claim 28 further comprising at least one reflective mirror for determination of liquid content based on conditions of multiple sides of the substance.

31. An apparatus as claimed in claim 28 comprising a plurality of radiometers to determine liquid content based on conditions of multiple sides of the substance.